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14. ABSTRACT This research will assess mental health and mental health service utilization over time among a representative sample of Reserve forces, within a multivariate causal framework that takes into account life course experiences and circumstances together with combat history, other military experience (e.g. humanitarian activity and activation for state missions) and civilian traumatic event experiences as determinants of mental health in this group. We focus not only on documenting the prevalence and correlates of PTSD and other mental illness and health service utilization among these forces, but also on documenting the <i>trajectories</i> of PTSD and co-occurring psychopathology over time among these forces. The scope includes developing, piloting and implementing a structured survey for a random sample of Reserve members. Findings from analyses of all four waves of the survey will be disseminated to key stakeholders. To date, we have constructed a survey for initial data collection as well as three subsequent waves that contains modules on (1) risk or protective factors for psychological morbidity over the life course (general traumas, psychological resources, life and family concerns), (2) mental health (depression, PTSD, emotional health history), (3) service utilization patterns (use of mental health resources). We have enrolled 1000 Reserves, and completed the baseline survey and three follow-up surveys. We have 2 manuscripts published, 2 under review, and 7 in preparation. Results have been disseminated at four national scientific conferences.					
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1. **INTRODUCTION:** This work will assess mental health and mental health service utilization over time among a representative sample of the Reserve forces, within a multivariate causal framework that takes into account life course experiences and circumstances together with combat history, other military experience (e.g. humanitarian activity and activation for state missions) and civilian traumatic event experiences as determinants of mental health in this group. We focus not only on documenting the prevalence and correlates of PTSD and other mental illness and health service utilization among these forces, but also on documenting the *trajectories* of PTSD and co-occurring psychopathology over time among these forces. Although there is a growing literature about the mental health and mental health needs of active duty military personnel, this would be the first study, as best we know, that has focused explicitly on the experience of the Reserve forces. For the reasons mentioned above, this group needs to be identified as a separate study population so that the special issues associated with their service can be examined. This study has implications for early intervention after exposure to traumatic events (including combat experiences and domestic deployment), training of the RC, and education of commanding officers and military leadership.

2. KEYWORDS: Reserve, Mental Health, Trauma, Resilience, PTSD

- 3. OVERALL PROJECT SUMMARY:** The project is now complete. Four waves of data collection, which entailed enrolling 1000 Reserve members, as well as piloting and completing four waves of telephone surveys is ended.

The individual tasks defined by the Statement of Work are summarized as follows:

Task 1. To develop a structured survey instrument that will assess (a) factors throughout the life course that may be risk or protective factors for psychological morbidity among Reserve members, (b) mental health, and (c) service utilization patterns among Reserve members.

Milestone: The final version of the survey instrument has been developed and contains: (a) risk or protective factors for psychological morbidity over the life course (e.g. modules on general traumas, psychological resources, life and family concerns), (b) mental health (e.g. modules on depression, PTSD, emotional health history) (c) service utilization patterns among Reserve members (e.g. use of mental health resources).

Task 2. To obtain final IRB approval from relevant local institutions (CU and USUHS) and Department of Defense.

Milestone: Final IRB approval was approved for the baseline survey from the original three institutions (UM, USUHS and DOD).

Task 3. To pilot test the instrument with a random sample of Reserves and modify the instrument as necessary to adequately reflect Reserve experiences.

Milestone: The survey instrument has been piloted with a random sample of the Reserves and the instrument has been modified as necessary to adequately reflect Reserve experience and shortened to reduce participant burden, and approved by DOD.

Task 4. To implement the survey among a randomly selected sample of 1,000 Reserve members using a combination of telephone and web-based techniques.

Milestone: Participant population selected and baseline survey, N=1000 interviews completed.

Task 5. To analyze survey data and to produce reports that are accessible to military, civilian, and scientific audiences and to prepare first follow-up survey wave (Wave 2).

Milestone: A number of whole cohort data analyses using the linked four-wave dataset are in progress. We have 2 manuscripts published, 2 under review, and 7 in preparation. Results have been disseminated at four national scientific conferences.

Task 6. To implement the first survey follow-up (Wave 2), re-contacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: Continuing IRB approval was obtained from the current institutions (CU and USUHS and Department of Defense), and the first follow-up survey (Wave 2) completed as of 11/15/2011.

Task 7. To analyze Wave 2 survey data and to produce reports that are accessible to military, civilian, and scientific audiences and to prepare a second follow-up survey wave (Wave 3).

Milestone: A number of whole cohort data analyses using the linked four-wave dataset are in progress.

Task 8. To implement the second survey follow-up (Wave 3), re-contacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: The second follow-up survey (Wave 3) was completed as of 01/11/2012.

Task 9. To implement the third survey follow-up (Wave 4), re-contacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: The third follow-up survey (Wave 4) was completed as of 12/15/2013.

Task 10: To link Wave 1, Wave 2, Wave 3, and Wave 4 data together for whole cohort multi-wave analysis. To prepare and clean data for whole cohort multi-wave analysis.

Milestone: Data has been cleaned, and prepared for each wave. In addition, all four waves have been linked together for whole cohort multi-wave analysis.

Task 11: To complete whole cohort multi-wave data analysis and to produce reports that are accessible to military, civilian, and scientific audiences. To disseminate results from the study to key stakeholders. Reports will be prepared and presented to organizations concerned with health of military personnel including the Assistant Secretary of Defense (Reserve Affairs), the Secretaries of the Army, Navy, and Air Force, the Surgeons General of the Army, Navy, and Air Force, the Chief of Staff of the Army, the Chief of Staff of the Air Force, the Chief of Naval Operations, the Commandant of the Marine Corps, the National Guard Bureau, and the Veteran's Administration.

Milestone: Final project report is completed herein; results have been disseminated at 4 national conferences - baseline results presented at ISTSS conference (2012), longitudinal results presented at American Public Health Association annual conference (2012), whole cohort analyses presented at annual ISTSS conference (2013) and American Public Health Association (2013); we have 2 manuscripts published, 2 under review, and 7 in preparation which use the linked four-wave dataset.

For a complete accounting of Results and Accomplishments, please see the appended manuscripts attached to this Report.

4. KEY RESEARCH ACCOMPLISHMENTS:

- Baseline survey piloted, implemented and completed
- 1000 Reservists enrolled and interviewed
- 3 Follow-up surveys piloted, implemented and completed
- Whole cohort, multi-wave dataset cleaned, prepared, and assembled for analysis
- Four national conference presentations – (1) International Society for Traumatic Stress Studies annual conference 2012, (2) American Public Health Association annual conference 2012, (3) International Society for Traumatic Stress Studies annual conference 2013, (4) American Public Health Association annual conference 2013
- Two manuscripts published, 2 under review, and 7 under preparation, which use the whole-cohort, multi-wave dataset:
 - In a publication on the prevalence of sexual violence and mental health symptoms among National Guard and Reserve soldiers, this research found that lifetime sexual violence prevalence was high among female soldiers, with approximately one-third of Reserve and National Guard women reporting a history. The majority of sexual violence was not related to the most recent deployment; however, sexual violence contributed to a high burden of psychopathology. Findings emphasize a need to screen for lifetime sexual violence and associated mental disorders in military samples.
 - In a publication on the prevalence of anger problems and post traumatic stress disorder in male and female National Guard and Reserve Service members, this research would appear to suggest that that anger treatment should be made available to current service members and that clinicians should assess anger problems irrespective of gender.

5. **CONCLUSION:** We have completed four waves of data collection, which entailed enrolling 1000 Reserve members, as well as piloting and completing four waves of telephone surveys.

Dissemination of baseline and longitudinal results of whole cohort analyses have occurred at national presentations, both at general public health (APHA, 2012, 2013) and trauma specialty conferences (ISTSS, 2012, 2013).

Manuscripts are being published, reviewed, finalized and prepared. We published one manuscript featuring whole cohort baseline analyses that examined the relationship between sexual violence and mental disorders, while another manuscript in press features longitudinal whole cohort analyses on the relationship between anger and PTSD. Two manuscripts are under review – one a descriptive overview of mental health conditions, demographics and military characteristics, and the other an examination of the interaction between gender and military rank in risk of depression and PTSD. An additional seven manuscripts are currently under preparation further examining this cohort and include specific deployment related circumstances in this component as well as genetic and gene-environment influences on susceptibility to deployment related mental health conditions.

Trajectory analyses of PTSD and co-occurring psychopathology among Reserves are in process and will examine the roles of pre-, peri- and post-deployment factors in disease etiology and course within a multivariate causal framework. We will document the joint contribution of military and civilian experiences and circumstances to the burden of psychopathology in the Reserve component. Additionally, we will examine the use of mental health services and unmet psychiatric need among the entire cohort, as well as key diagnostic subgroups such as those with alcohol use problems and comorbid presentations of mental health disorder. Several analysis plans are in progress, including analyses that are both substantive and methodological in nature.

This representative data set is extremely rich and has already offered the opportunity to examine important questions of public health significance with novel longitudinal methods. We look forward to further dissemination of current findings, and discovery and dissemination of future findings in both general public health and trauma-focused settings, including conferences and academic journals.

6. PUBLICATIONS, ABSTRACTS, AND PRESENTATIONS:

- a. List all manuscripts submitted for publication during the period covered by this report resulting from this project. Include those in the categories of lay press, peer-reviewed scientific journals, invited articles, and abstracts. Each entry shall include the author(s), article title, journal name, book title, editors(s), publisher, volume number, page number(s), date, DOI, PMID, and/or ISBN.

(1) Lay Press:

(2) Peer-Reviewed Scientific Journals:

Published:

- Walsh K, Koenen KC, Cohen GH, Ursano R, Gifford RK, Fullerton CS, Galea S. Sexual violence and mental health symptoms among National Guard and Reserve soldiers. *Journal of General Internal Medicine*. Aug 2013. [PMID: 23918158]
- Worthen, M., Rathod, S., Cohen, G., Sampson, L., Ursano, R., Gifford, R., Fullerton, C., Galea, S., Ahern, J. Anger Problems and Posttraumatic Stress Disorder in Male and Female National Guard and Reserve Service Members. *Journal of Psychiatric Research*. (*In Press*)

Under Review:

- Worthen M, Rathod S, Cohen G, Sampson L, Ursano RJ, Gifford R, Fullerton C, Galea S, Ahern J. *Anger and Posttraumatic Stress Disorder in a Trauma-Exposed Military Population: Differences by Gender and Trauma Type*.
- Russell DW, Cohen G, Gifford R, Fullerton C, Galea S, Ursano R. *Mental Health Among A Nationally Representative Sample Of Military Reserve Component Personnel*.

Under Preparation:

- *Differential Trajectories Of Alcohol Misuse Across The Deployment Cycle Of US National Guard And Reserve Soldiers*
- *Gender And Military Authority: The Impact Of Gender And Military Rank On Risk Of Mental Health Problems*
- *Genetic Influences On Susceptibility To Military Deployment Related Mental Health Conditions*
- *Gene-Environment Interactions In Susceptibility To Military Deployment Related Mental Health Conditions*

- *Incidence Of PTSD And Depression In A Representative Sample Of US National Guard And Reserve*
- *Individual Mobilization Augmentation And Risk Of Mental Health Problems Among Deployed Soldiers*
- *PTSD Psychopathology In A Representative Sample Of US National Guard And Reserve: A Latent Growth Mixture Modeling Approach*

(3) Invited Articles:

(4) Abstracts:

b. List presentations made during the last year (international, national, local societies, military meetings, etc.). Use an asterisk (*) if presentation produced a manuscript.

- Galea, S (2013) Ongoing Cohorts Studying Mental Health Among U.S. Reserve Forces. In Cohort Profiles: Population-based Studies of Trauma and its Aftermath Symposium (Gradus, chair), presented at the annual meeting of the International Society for Traumatic Stress Studies, Philadelphia, PA.*
- Walsh K, Cohen GH, Koenen KC, Ursano R, Gifford RK, Calabrese JR, Tamburrino MB, Liberzon I & Galea S (2012). Prevalence of Sexual Trauma and Mental Health Sequelae Among Three Representative Samples of Reserve and National Guard Personnel. In K Walsh (Chair), Sexual Trauma and Mental Health Outcomes Among Military and Veteran Samples: Prevalence and Characteristics, Treatment Needs, and Barriers to Treatment. Symposium presented at the annual meeting of the International Society for Traumatic Stress Studies, Los Angeles, CA.*
- Worthen M. (2013) Violence And Post-Traumatic Stress Disorder In Reserve And National Guard Service Members, Conference paper presented at American Public Health Association Annual Meeting, Boston, MA.*
- Worthen, M. (2012) Anger problems in United States Military service members: A mixed methods approach, Conference paper presented at American Public Health Association Annual Meeting, San Francisco, CA.*

7. INVENTIONS, PATENTS AND LICENSES: Nothing to report.

8. REPORTABLE OUTCOMES: Nothing to report.

9. OTHER ACHIEVEMENTS: Nothing to report.

10. REFERENCES: Please see the appended manuscripts attached to this Report for a list of references pertinent to the research performed.

11. APPENDICES:

- (1) MANUSCRIPT #1: SEXUAL VIOLENCE AND MENTAL DISORDERS AMONG NATIONAL GUARD AND RESERVE SOLDIERS (6 pages)
- (2) MANUSCRIPT #2: ANGER PROBLEMS AND POSTTRAUMATIC STRESS DISORDER IN NATIONAL GUARD AND RESERVE SERVICE MEMBERS (7 pages)

Sexual Violence and Mental Health Symptoms Among National Guard and Reserve Soldiers

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BACKGROUND: Reserve and National Guard (NG) soldiers report disproportionate mental health problems relative to active duty military upon returning from the Iraq and Afghanistan conflicts. However, few studies have examined whether exposure to particular types of traumatic events (e.g., lifetime sexual violence) is associated with this increased burden of psychopathology.

OBJECTIVE: The current study examined the prevalence of lifetime sexual violence exposure as well as the adjusted odds and population attributable fraction of psychopathology associated with sexual violence in a large sample of male and female Reserve and NG soldiers.

DESIGN: Baseline structured telephone interviews were conducted in 2009.

PARTICIPANTS: 1,030 Reserve (23 % female) and 973 NG (15 % female) soldiers.

MAIN MEASURES: Four items assessed lifetime and deployment-related sexual violence. Probable lifetime and past-year posttraumatic stress disorder (PTSD) and depression were assessed with the PTSD Checklist and the Patient Health Questionnaire, respectively.

KEY RESULTS: Lifetime sexual violence prevalence was 37.4 % and 27.6 % among Reserve and NG women, and 4.3 % and 3.7 % among Reserve and NG men, respectively. Recent deployment-related sexual violence ranged from 1.4 to 2.6 % for women and 0 % for men. Regression analyses indicated that the adjusted odds of probable past-year and lifetime PTSD and depression were 1.2 to 3.5 times greater among those reporting sexual violence relative to non-victims. The proportion of probable lifetime PTSD and depression attributable to sexual violence was 45.2 % and 16.6 %, respectively, in the Reserves, and 10.3 % and 6.2 %, respectively, in the NG.

CONCLUSIONS: Lifetime sexual violence prevalence was high among female soldiers, with approximately one-third of Reserve and National Guard women reporting a history. The majority of sexual violence was not related to the most recent deployment; however, sexual violence contributed to a high burden of psychopathology. Findings emphasize a need to screen for lifetime sexual violence and associated mental disorders in military samples.

KEY WORDS: reserve; national guard; sexual violence; PTSD; depression.

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BACKGROUND

Sexual violence, which refers to rape (i.e., penetration by force, threat of force, or drug or alcohol incapacitation) and the broader experience of sexual assault (i.e., unwanted sexual contact occurring by force, threat of force, or manipulation), is highly prevalent in the US; one in five women and one in 71 men report lifetime rape, while 27.2 % of women and 11.7 % of men report lifetime unwanted sexual contact.¹ Relative to other forms of violence, sexual violence is associated with the highest losses in quality-adjusted life years² and significant costs to society in police and victim advocate services; medical and mental health treatment; and loss of productivity, wages, and quality of life.³ Sexual violence also contributes to psychopathology. Posttraumatic stress disorder (PTSD) and depression are the most commonly reported, as well as impairing mental health consequences.^{4–7}

Best estimates suggest that 19–42 % of U.S. service members returning from Iraq and Afghanistan report mental health problems.^{8–10} Although media attention to sexual violence among military personnel has increased in the last decade, few studies have systematically examined the prevalence and correlates of lifetime sexual violence in non-treatment seeking, non-Department of Veterans Affairs (DVA) military samples. Prior studies have examined unwanted sexual experiences (including harassment and assault) occurring during military service among patients seeking services through the DVA.^{11–14} One rigorous study found that 15 % of women and 0.7 % of men reported unwanted military-related sexual experiences.¹² Only three studies have assessed sexual violence prior to military engagement using non-treatment seeking active duty samples.^{15–17} Among a representative sample of Air Force women, 28 % reported lifetime sexual violence.¹⁵ In two

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studies using nonrepresentative samples of active duty soldiers, 38 % of female Navy recruits reported adolescent or adult sexual violence (since age 14),¹⁶ and 6 % of Army men and 50 % of Army women reported lifetime sexual violence.¹⁷ All three studies found that the majority of incidents involved assaults by civilians when the victims were civilians, suggesting that clinicians and researchers may be overlooking important risk factors for mental disorders when sexual violence is assessed only in the context of military service. To date, no epidemiologic studies have examined sexual violence among non-treatment seeking Reserve and National Guard men and women, which has hindered our understanding of the scope and burden of sexual violence among this unique subset of military personnel.

The present study advances research by documenting the prevalence of sexual violence (both lifetime and during most recent deployment) and associated psychopathology among two national samples of non-treatment seeking male and female soldiers. The present study also examined whether deployment was a risk factor for sexual violence and whether soldiers who had sought treatment through the DVA were more likely to report sexual violence.

METHODS

Participants and Procedures

Data were drawn from the baseline survey of an ongoing longitudinal study of military experiences, health/mental health status, and service utilization (R01MH082729). Reserve and National Guard soldiers serving as of June 2009 were recruited using a stratified random sample from the Defense Manpower Data Center. Contact information was obtained for 10,000 Reserve and 10,000 National Guard soldiers, a sampling frame representative of the national U.S. Reserve and Guard population. A random sample of 9,751 soldiers was invited to participate in a research study about experiences of military personnel; 1,097 returned an opt-out letter. After excluding incorrect/non-working telephone numbers (2,866 or 29.4 % of the possible 9,751), 6,885 working numbers (71 %) were called; 324 (3 %) were not eligible (e.g. no longer enrolled or retired), 1,097 (11 %) did not wish to participate, 61 (1 %) were disqualified because they did not speak English or had hearing problems, and 3,386 (35 %) were not yet contacted before the cohort closed. A total of 2,003 Reserve and National Guard service personnel were interviewed at baseline (January–July 2010). Using American Association for Public Opinion Research definitions,¹⁸ the overall cooperation rate (defined as number consented divided by number of successfully contacted working numbers; $2,003 + 324 + 61 / 6,885 - 3,386$) was 68.2 %, and the overall response rate (defined as those who completed the survey plus those who consented but were ineligible, divided by the

number of working numbers minus disqualified; $2,003 + 324 / 6,885 - 61$) was 34.1 %. Reserve responders were more likely than non-responders to be female (24 % vs. 20 %, $p < 0.01$), white (75.4 % vs. 69.5 %, $p < 0.001$), older (49.6 % vs. 41.3 %, $p < 0.001$), college-educated (46.7 % vs. 34.6 %, $p < 0.001$), and officers (28.1 % vs. 17.9 %, $p < 0.001$). NG responders were more likely than non-responders to be white (83.5 % vs. 79.4 %, $p < 0.001$), older (38.5 % vs. 32.6 %, $p < 0.01$), college-educated (48.8 % vs. 37.1 %, $p < 0.001$), officers (16.3 % vs. 10.5 %, $p < 0.001$), and currently married (51.4 % vs. 46.4 %, $p < 0.01$).

Trained interviewers obtained informed consent, administered a 60-minute telephone interview using computer-assisted telephone interview (CATI) technology, and offered \$25 compensation. The study protocol was approved by the U.S. Army Medical Command's Congressionally Directed Medical Research Programs unit, the Human Research Protection Office at the U.S. Army Medical Research and Materiel Command, and the Institutional Review Boards at the Uniformed Services University of the Health Sciences and Columbia University.

Measures

Sexual Violence. As part of a screening for twenty-one different traumatic events, participants were asked, "In your lifetime, have you ever 1) been raped? 2) experienced another kind of sexual assault or unwanted sexual contact as a result of force, threat of harm, or manipulation?" Participants who responded affirmatively to either question were considered lifetime sexual violence victims. A follow-up yes/no question was asked regarding whether that experience was related to the respondent's most recent deployment. Deployments were defined as "any mobilization both nationally and internationally and in any military capacity." Affirmative responses to other traumatic events were summed to create a score for "other traumas."

Probable PTSD. Participants who reported any traumatic event were instructed to identify the "worst" event. For those who noted that they responded to this event with fear, helplessness, or horror, a modified version of the PTSD Checklist-Civilian¹⁹ (PCL-C) version was administered. The PCL-C consists of seventeen items corresponding to the Diagnostic and Statistical Manual of Mental Disorders—4th Edition (DSM-IV) criteria for PTSD. Participants responded to each item on a Likert-type scale ranging from 1 = *Not at All* to 5 = *Extremely*. Participants also rated degree of symptom interference with occupational or social pursuits from 1 = *Not at All* to 4 = *Extremely*. The PCL-C was modified to ask how much participants were "ever" bothered by PTSD symptoms related to their worst event and a follow-up question was asked regarding when they were last bothered by symptoms (e.g., within the previous 12 months). To meet probable PTSD

criteria, respondents must have endorsed: 1) a traumatic event; 2) a response that involved helplessness or terror; 3) at least one re-experiencing symptom of moderate severity; 4) at least three avoidance/numbing symptoms of moderate severity; 5) at least two hyperarousal symptoms of moderate severity; 6) a symptom duration of at least one month; and 7) impairment in social or occupational functioning or extreme distress due to these symptoms. The PCL-C has good reliability, validity, and psychometrics in this population.^{20–22}

Probable Depression. Participants completed the Patient Health Questionnaire²³ (PHQ-9) to assess nine DSM-IV symptoms of Major Depression experienced for a period of two weeks or more. If participants responded affirmatively to any depression items, they rated the severity of that symptom from 1 = *several days* to 3 = *nearly every day*. To meet criteria for probable depression, participants had to endorse two or more depression symptoms plus anhedonia or depressed mood at least more than half the days over the course of a two-week period in their lifetime. Finally, participants were asked whether the two weeks of depressive symptoms had occurred in the previous year. Clinical validation work with this population suggests that this broader definition of depression (versus Major Depression specifically) assessed on the PHQ-9 corresponds most closely to depression as assessed in clinical interviews.^{21,22}

Potential Covariates. Sexual violence, PTSD, and depression have been associated with younger age, being unmarried, enlisted rank, and number of other traumatic events experienced.¹⁴ Covariates that were significantly associated with PTSD and depression were included in multivariate analyses.

Statistical Analyses

First, chi-square analyses were used to examine differences between the Reserve and NG samples on demographic characteristics. Second, prevalence of lifetime and deployment-related sexual violence was examined by sample (Reserve and NG) and by gender (female, male). Third, unadjusted and adjusted (for significant covariates) odds ratios and corresponding 95 % confidence intervals (CIs) were calculated from logistic regression analyses predicting probable PTSD and depression from sexual violence. Consistent with other studies examining the effects of violence exposure on mental health outcomes,²⁴ population attributable fractions (PAFs) were calculated using the following formula: $(P(OR-1)/1+P(OR-1))$, where P is the proportion of individuals in the population endorsing sexual violence, and OR is the adjusted odds ratio for sexual violence and probable PTSD or depression. Fourth, sensitivity analyses examining whether sexual violence prevalence estimates differ among deployed versus non-deployed soldiers as well as among those who have and have not sought services through the VA

were examined. Weights adjusting for sample design, non-response characteristics (see responder and non-responder analyses above), and participant sociodemographic characteristics (relative to those of the overall Reserve and NG population) were constructed in SUDAAN using the Wtadjst procedure, and have been applied in all analyses.

RESULTS

Demographic Characteristics and Covariate Analyses

The Reserve sample contained more women and soldiers 45 or older compared to the NG sample (Table 1). Reserve soldiers were more likely to be ethnic minority, college or graduate school educated, and officers (versus enlisted) when compared to NG soldiers. NG soldiers were more likely to have ever been deployed relative to Reserve soldiers. Reserve and NG soldiers reported a similar number of other traumatic events. Sexual violence victims and non-victims did not differ on age or rank; however, victims reported a greater number of other traumatic events compared to non-victims.

Sexual Violence Prevalence

Figure 1 shows that lifetime sexual violence prevalence ranged from 27.6 % for NG women to 37.4 % for Reserve women. Among men, estimates were 3.7 % in the NG sample and 4.3 % in the Reserve sample. The prevalence of sexual violence during the most recent deployment ranged from 1.4 % ($n=2$) for NG women to 2.3 % ($n=5$) for Reserve women. For men, estimates were 0.0 % for both samples.

Probable Lifetime and Current PTSD and Depression by Lifetime Sexual Violence

Reserve Sample. The prevalence of probable lifetime and past-year PTSD by sexual violence was 33.2 and 16.8 %, respectively (Table 2). Prevalence of probable lifetime and past-year depression was 39.7 and 15.4 %, respectively. Adjusted models indicated that sexual violence victims had 3.5 times greater odds of probable lifetime PTSD, 2.5 times greater odds of reporting probable past-year PTSD, and 1.5 times greater odds of reporting probable lifetime depression relative to those without sexual violence. PAFs indicated that 45.2 % of probable lifetime PTSD, 20.1 % of probable past-year PTSD, and 16.6 % of probable lifetime depression could be attributed to lifetime sexual violence.

NG Sample. Prevalence of probable lifetime and past-year PTSD among sexual violence victims was 22.9 and 11.7 %, respectively; prevalence of lifetime and past-year

Table 1. Descriptive Information and Differences Between Samples on Demographic Characteristics

Characteristic	Reserve (N=1030)	NG (N=973)	P Value
	n (%)	n (%)	
Gender			< 0.001
Male	792 (78.8)	826 (85.6)	
Female	238 (21.2)	147 (14.4)	
Age			< 0.001
18–24	211 (26.4)	243 (32.6)	
25–34	316 (31.5)	332 (32.0)	
35–44	273 (24.0)	253 (23.6)	
45+	214 (18.2)	134 (11.7)	
Race			< 0.001
White (incl. Hispanic)	733 (75.4)	770 (83.5)	
Black (incl. Hispanic)	149 (18.9)	94 (12.6)	
Other (incl. Hispanic)	145 (5.8)	103 (4.0)	
Education			< 0.001
HS/GED or less	159 (19.9)	200 (26.1)	
Some College/Tech. Training	424 (48.2)	447 (50.9)	
College/Graduate degree	442 (31.9)	321 (23.0)	
Marital Status			< 0.001
Married	558 (50.3)	499 (47.5)	
Divorced/Separated/Widowed	122 (11.9)	126 (12.3)	
Never Married	349 (37.8)	344 (40.2)	
Rank			< 0.001
Officer	292 (16.8)	177 (9.7)	
Enlisted, cadets & civilian employed	738 (83.2)	789 (90.3)	
Ever Deployed			< 0.001
No	284 (29.6)	230 (25.7)	
Yes	739 (70.4)	739 (74.3)	
Trauma History	Mean (SD)	Mean (SD)	
Number of lifetime traumatic events (excluding sexual trauma)	9.7 (5.8)	9.3 (5.8)	0.06

ns numbers

Raw ns and weighted percentages are presented

depression was 33.1 and 14.4 %, respectively. Adjusted models indicated that sexual violence victims had 1.5 times greater odds of probable lifetime and past-year PTSD and 1.2 times greater odds of probable lifetime depression. PAFs indicated that 10.3 % of probable PTSD, 5.5 % of probable past-year PTSD, and 6.2 % of probable lifetime depression could be attributed to lifetime sexual violence.

Sensitivity Analyses

Chi-square analyses revealed that never deployed soldiers were more likely to report lifetime sexual violence exposure relative

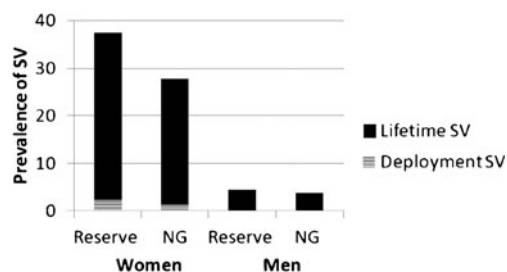


Figure 1. Prevalence of any sexual violence and deployment-related sexual violence for women and men in the reserves and National Guard.

to ever deployed soldiers. Among Reserves, 9.5 % ($n=71$) of ever deployed reported sexual violence compared to 15.3 % ($n=46$) of never deployed, $p < 0.01$. In NG, 5.8 % ($n=26$) of ever deployed reported sexual violence compared to 10.3 % ($n=41$) of never deployed, $p < 0.01$. Sexual violence victims and non-victims in both the Reserves and NG did not differ in likelihood of seeking services through the VA or military.

COMMENT

This study is the first to document pervasive exposure to sexual violence over the lifecourse in two large national samples of female and male Reserve and National Guard soldiers. Approximately 27–37 % of women and 4 % of men reported lifetime sexual violence; 0–2.6 % of soldiers reported sexual violence during their most recent deployment. In both samples, sexual violence was associated with increased risk for probable lifetime and past-year PTSD and depression, although findings were attenuated in the NG sample after controlling for covariates. Furthermore, a substantial proportion of probable lifetime PTSD and a modest proportion of probable lifetime depression and past-year PTSD could be attributed to sexual violence exposure, particularly in the Reserve sample.

General population prevalence estimates suggest that 18 % of women and 1.4 % of men report rape, while 27 % of women and nearly 12 % of men report unwanted sexual contact.¹ Thus, while female soldiers reported higher prevalence of lifetime sexual violence compared to the general population, male soldiers reported prevalences that are consistent or lower than those in the general population. Differences between community-residing women and female soldiers suggest that women who are drawn to military service may have more severe early life adversity, including sexual violence. Indeed, prior studies assessing sexual violence among women in the military have found estimates ranging from 28 to 50 %; estimates in the current study were consistent with some prior reports,^{15,16} but lower than others.¹⁷ The majority of sexual violence reported in this study occurred prior to the most recent deployment. Contrary to studies with DVA patients that have found military sexual trauma prevalence estimates of 0.7 % for men and 15 % for women, the current study found that 0 % of men to 2.6 % of women reported sexual violence during the most recent deployment. Assessments may have underestimated sexual violence occurring during any military service as questions pertained only to most recent deployment; however, this concern was tempered by findings that deployment was not associated with increased reports of

Table 2. Prevalence, Adjusted Odds, and Population Attributable Fractions (PAFs) of Reporting Lifetime and Past-Year PTSD and Depression for Lifetime Sexual Violence Victims

	Lifetime PTSD				Past-Year PTSD				Lifetime Depression				Past-Year Depression			
	N (%)	OR	AOR	PAF %	N (%)	OR	AOR	PAF %	N (%)	OR	AOR	PAF %	N (%)	OR	AOR	PAF %
Res	39 (33.2)	5.2 (5.0,5.3)	3.5 (3.3,3.6)	45.2	19 (16.8)	5.2 (5.1,5.4)	2.5 (2.4,2.6)	20.1	49 (39.7)	2.9 (2.8,2.9)	1.5 (2.4,1.5)	16.6	16 (15.4)	2.1 (2.0,2.2)	1.0 (0.9,1.1)	0.0
NG	15 (22.9)	2.3 (2.2,2.3)	1.5 (1.4,1.6)	10.3	7 (11.7)	2.4 (2.3,2.5)	1.5 (1.4,1.6)	5.5	21 (33.1)	1.83 (1.8,1.9)	1.2 (1.2,1.2)	6.2	8 (14.4)	1.7 (1.6,1.8)	1.0 (0.9,1.0)	0.0

Res Reserve; NG National Guard; OR unadjusted odds for sexual violence relative to non-sexual violence; AOR adjusted (for age, race, gender, educational attainment, marital status, ever deployed, and number of other traumatic events) odds for sexual violence relative to non-sexual violence; PAF population attributable fraction; ns numbers

Raw ns and weighted percentages and estimates are presented

lifetime sexual violence. Gender differences in deployment and lifetime sexual violence may explain this finding, as women reported more lifetime sexual violence and were less likely to have been deployed relative to men. Recent deployment-related sexual violence also may have been lower than reports from veteran samples, because only the most severe sexual violence (rape and sexual assault) was assessed with confidential, but not anonymous, surveys.

Findings highlight the importance of measuring sexual violence over the lifecourse, even among non-treatment seeking samples, to best understand the impact of sexual violence on soldiers' mental health. Adjusted models indicated that the odds of probable past-year and lifetime PTSD were two to three times higher among sexual violence victims compared to non-victims, although associations between sexual violence and mental health problems were attenuated in the NG sample. Similarly, PAFs suggested that eliminating sexual violence would reduce the prevalence of probable lifetime PTSD and depression by 45 % and 16.6 %, respectively, in the Reserves, and 10 % and 6 %, respectively, in the NG. The NG sample was younger, less educated, more likely to be enlisted, and more likely to have been deployed, which could increase risk for mental health problems; additional research is required understand why associations between sexual violence and mental health problems were attenuated in this group.

Results should be considered in the context of study limitations. Data regarding sexual violence exposure and symptoms of PTSD and depression were self-reported, and thus may be susceptible to biases or inaccuracies in recall. Further, the use of single questions that required individuals to label their experiences as rape or sexual assault likely underestimated the prevalence of sexual assault (as opposed to methods that use multiple behaviorally specific items that avoid labels like "rape").²⁵ In contrast to the DVA definition of military sexual trauma, the current study did not query soldiers about sexual harassment experiences during military service. Additionally, measures used in the present study

assessed various types of traumatic events, but did not assess the number of times each event occurred or ages at which respondents experienced events. Deployment-related sexual violence was assessed only during the most recent deployment; thus, we cannot account for sexual violence exposure occurring during previous deployments in this analysis. Further, sexual violence can occur in other non-deployment military contexts (e.g., stateside, during training). Future studies should collect information about the nature, time line, and context in which sexual violence experiences occurred. Additionally, data were cross-sectional. Thus, pre-military functioning measures are not available, and definitive statements about directionality cannot be made without additional longitudinal research. Although cooperation rates were consistent with those of other recent epidemiologic samples,²⁶ efforts should be made to improve participation. Finally, although weights were applied to account for non-response bias, soldiers who refused to participate could, in theory, differ from those who did not on key variables of interest (e.g., sexual violence, mental health).

Despite these limitations, our findings begin to address an important issue among Reserve and National Guard personnel that has implications for the assessment of sexual violence and associated psychopathology among military samples. Practitioners who focus only on sexual violence during military service may miss an important contingent of soldiers with lifetime sexual violence experiences that could be contributing to mental health problems. Although lifetime sexual violence estimates were similar to those found in prior studies with female soldiers, recent deployment-related sexual violence was lower than the prevalence reported among treatment-seeking veterans. Sexual violence is commonly under-reported,²⁷ and soldiers may be especially concerned about stigma, fear of negative consequences, and feelings of shame.¹¹ However, soldiers with military or pre-military sexual violence exposure may benefit from the evidence-based treatments that have been developed to address PTSD and depression,

thus, destigmatizing sexual violence disclosure and mental health treatment-seeking among military samples should be an important focus of clinical, research, and policy efforts.

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Anger problems and posttraumatic stress disorder in male and female National Guard and Reserve Service members



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ABSTRACT

Anger is a common problem among veterans and has been associated with posttraumatic stress disorder (PTSD). This study aimed to improve understanding of how anger and PTSD co-occur by examining gender differences and differences by whether the triggering traumatic event is deployment-related vs. civilian-related in current service members. A representative cohort of Reserve and National Guard service personnel ($n = 1293$) were interviewed to assess for deployment- or civilian-related traumas, PTSD, and anger. The prevalence of self-reported anger problems was estimated among male ($n = 1036$) and female ($n = 257$) service members. Log Poisson regression models with robust standard errors were used to estimate the associations of problems with anger with PTSD and PTSD symptom severity for men and women. Self-reported anger problems were common among male (53.0%) and female (51.3%) service members. Adjusted prevalence ratios (PR) showed associations between anger and PTSD connected to both civilian- and deployment-related traumas (PR were 1.77 (95% CI 1.52–2.05) and 1.85 (95% CI 1.62–2.12), respectively). PTSD symptom severity was also associated with anger. This study was cross-sectional and so a causal relationship between PTSD and anger cannot be established. Problems with anger are common among male and female current Guard and Reserve members. These findings suggest that anger treatment should be made available to current service members and that clinicians should assess anger problems irrespective of gender. Future research should examine the effectiveness of anger treatment protocols by gender.

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1. Objectives of the study and background

Anger problems are common among military veterans, with population-based estimates of the prevalence of self-reported anger in post 9/11 veterans ranging between 44% and 57% (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007). In both military and civilian populations, anger problems have been associated with a number of negative consequences, including poor family functioning (Taft et al., 2008), negative workplace and school outcomes (Hershkovis et al., 2007; Thomas and Smith, 2004),

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aggression (Teten et al., 2010), and poorer treatment outcomes for posttraumatic stress disorder (PTSD) (Forbes et al., 2008).

PTSD is one of the signature wounds of war. PTSD is of particular public health concern for service members who have deployed in support of the wars in Iraq and Afghanistan as these wars have been characterized by longer and multiple deployments, which are known to increase the risk of PTSD (Reger et al., 2009; Smith et al., 2011). Between 11.6% and 24.5% of recently redeployed service members have been found to have PTSD, with higher incidence among Reserve and National Guard members compared to Active Duty military (Litz and Schlenger, 2009; Milliken et al., 2007).

While there have been no population-based studies of the association between PTSD and anger problems in veterans or military service members, the co-occurrence of PTSD and anger problems has been documented in several studies of veterans in treatment for psychosocial problems, substance abuse, and domestic violence

(e.g. Beckham et al., 1998; Jakupcak et al., 2007; Kulkarni et al., 2012; Lasko et al., 1994; McFall et al., 1999; Novaco et al., 2012). Most research on anger and PTSD has been conducted with male veterans, and a few studies have included both male and female veteran participants. However, none of these studies have presented sub-analyses by gender and so it remains unknown whether the association between PTSD and anger is similar in men and women veterans (Elbogen et al., 2010; Ouimette et al., 2004). The only study to date that compared the association between anger and PTSD in men and women compared a sample of male veterans with PTSD to a sample of female victims of childhood or adult sexual trauma with PTSD; the latter group consisted not just of women veterans, however, but also civilian wives of male service-connected veterans (Castillo et al., 2002). In this study, men had higher levels of anger than women. While there are no studies that examine the association between anger and PTSD in women veterans, a study with women Vietnam veterans seeking treatment at a mental health clinic documented higher levels of hostility in women with PTSD compared to treatment-seeking women without PTSD (Butterfield et al., 2000). Given that women make up 19.5% of Reserve and 15.5% of National Guard service members (The Women's Memorial, 2011), and women are now allowed to serve combat duty, increasing their risk of trauma during future deployments (Roulo, 2013), understanding the relations between anger and PTSD in women service members and veterans is critical. Furthermore, understanding whether and how these relations may differ between men and women will aid in developing appropriate interventions to prevent and treat anger and PTSD.

Less is known about the relations between anger and PTSD in current service members than among veterans who are out of the service. Two recent studies have found high levels of comorbidity between anger and PTSD in current service members (Novaco et al., 2012; Thomas et al., 2010). The first study examined treatment-seeking soldiers recently returned from Afghanistan or Iraq (Novaco et al., 2012), while the second study examined National Guard soldiers recently returned from Iraq (Thomas et al., 2010). In order to capture, address, and alleviate the long-term negative consequences of anger and PTSD, understanding the prevalence of anger and the relations between anger and PTSD in current service members is important.

Furthermore, military service members are at risk of PTSD not just from deployment-related traumas, but also from traumas they may experience outside of deployment, such as car accidents or violent crimes. In a meta-analysis by Orth and Wieland (2006) examining the correlation between anger and PTSD in studies of traumatized adults, the authors found a stronger correlation between anger and PTSD in samples with military war experience compared to any other type of trauma. However, they noted that it was impossible to ascertain whether this increased association was due to trauma event type or due to pre-event differences in sample populations. Understanding the role of the context of the triggering traumatic event on the association between anger and PTSD within an all-military population will help guide appropriate interventions with service members who experience trauma and its sequelae in either context.

To improve our understanding of anger in military service members, we estimated the prevalence of anger in a random, representative sample of male and female National Guard and Reserve soldiers. Previous research is limited because it has been based on treatment-seeking military populations. Second, we estimated the association between anger problems and PTSD among men and women. While there is a sizable body of research documenting the association between PTSD and anger in men, there is limited research on women. Third, we estimated the association between anger problems and PTSD separately for PTSD due to deployment- vs. civilian-related traumas. We hypothesized

that the association between anger and PTSD would be stronger in those with deployment-related PTSD compared to those with only civilian-related PTSD.

2. Materials and methods

The U.S. Army Medical Command's Congressionally Directed Medical Research Programs Unit, the Human Research Protection Office at the U.S. Army Medical Research & Materiel Command, and the Institutional Review Boards at both the Uniformed Services University of the Health Sciences and Columbia University approved the study protocol. Verbal informed consent was obtained from all participants.

2.1. Study population

We obtained contact information for a stratified random sample of National Guard ($N = 10,000$) and Reserve ($N = 10,000$) soldiers who were serving in the military as of June 2009 through the Defense Manpower Data Center (DMDC) from which we began to recruit participants into a cohort study. A random sample of 9751 (4788 National Guard, 4963 Reserves) soldiers were selected to participate and mailed information about the study along with an opt-out letter. After excluding incorrect/non-working telephone numbers (2866/9751 or 29.4%), 6885 working numbers (71%) remained as viable for participant recruitment. We excluded 324 (3%) who were not eligible (e.g. no longer enrolled or retired), and disqualified 61 (1%) because they either did not speak English above an 8th grade level or had hearing problems; 1097 (11%) did not wish to participate, and 3386 (35%) had not yet been contacted when we reached our target sample size. A total of 2003 service personnel were interviewed at baseline, with an overall cooperation rate of 68.2% ($2003 + 324 + 61 / 6885 = 3386$), defined as the number of participants who consented regardless of eligibility ($2003 + 324 + 61 = 2388$) divided by the number of working numbers we successfully contacted ($6885 - 3386 = 3499$). The overall response rate was 34.1% ($2327 / 6824$); defined as the number of participants who completed a survey or consented but were ineligible, divided by the number of working numbers minus those that were disqualified ($2003 + 324 / 6885 - 61$). Consent to participate in the study began in January 2010 and ended July 2010. Participants were compensated for their time with \$25 for an approximately 50 min interview. A second wave of data collection beginning in January 2011 and ending in November 2011 attempted to reach 1996 of the wave 1 participants (7 of the original participants declined further participation at the end of the first interview). We were able to resolve 1428 (72%) of the telephone numbers ($251 / 1996$ or 13% were incorrect/non-working telephone numbers and $317 / 1996$ or 16% remained unresolved after up to 60 attempts). We excluded 3 individuals due to hearing or other health problems and 132 (7%) declined to participate. The remaining 1293 participants completed this second wave survey. The cooperation rate was 91% ($1293 + 3 / 1393 + 132 + 3$) and the response rate was 74% ($1293 + 3 / 1745 - 3$). Participants who were interviewed at baseline were eligible to be interviewed in the second wave regardless of whether they had retired or separated from the Reserve or National Guard between waves 1 and 2. Interviews in the second wave averaged 37 min and participants were paid a \$25 stipend for participating in the survey. For the present study, data on gender and race was obtained from the first wave of data; all other variables were obtained from the second wave of data.

2.2. Interviews

In each wave of data collection, participants were administered a telephone survey using a computer-assisted telephone interview

(CATI). The survey included questions on military history and experiences, deployment-related and civilian psychopathology, health status, mental health service use, health-risk behaviors, and demographic characteristics. The second wave data also included questions about problems experienced with anger.

2.3. Measures

2.3.1. Traumatic events

To assess deployment history and traumatic events experienced during the most recent deployment, we used items adapted from the Deployment Risk and Resilience Inventory (DRRI) (King et al., 2006). In addition, we assessed exposure to PTSD criterion A events using a list of traumatic events developed by the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 1989). This series captures both civilian traumas and traumas that occurred during a military deployment. Participants were offered an opportunity to describe any other traumatic event that they reported was the “worst” trauma they had experienced. Participants were asked after each item when the event occurred and whether the event occurred in relation to their most recent deployment. Participants were asked about traumatic events experienced in their lifetime at the first wave and asked about events occurring since the first wave during the second wave of the study.

2.3.2. Anger

Anger was measured using a four-item scale developed from questions in the Dimensions of Anger (DAR) scale (Forbes et al., 2004). The DAR is a brief instrument that has been used in several studies of military populations (Forbes et al., 2004; Hawthorne et al., 2006; Nederlof et al., 2009). The four items assessed the frequency, intensity, antagonism, and impairment involved with the respondent's experience of anger in the past 12 months. Example items include “My anger prevents me from getting along with people as well as I'd like to”, and “When I get angry at someone, I want to clobber the person.” Respondents rated how much they disagreed or agreed with each statement on a 5-point Likert scale, ranging from strongly disagree to strongly agree. A factor analysis on this scale found one factor, with loadings ranging from 0.64–0.69. Cronbach's alpha for the scale was good at 0.78 with item-test correlations ranging from 0.76 to 0.80. Participants were coded as having a problem with anger if they responded that they “agreed” or “strongly agreed” with any of the four statements.

2.3.3. Posttraumatic Stress Disorder (PTSD)

To assess PTSD, we asked participants about their experience of symptoms consistent with DSM-IV criteria for PTSD. We used the PTSD Checklist-C (PCL) to evaluate these symptoms (Keen et al., 2008; Weathers et al., 1993). The PCL-C has been widely used in military populations and was more appropriate for this study than the PCL-M because we also sought to capture civilian events. The PCL has good psychometric properties. In one military population, the scale was shown to have an internal consistency of 0.97 and consistency within subscales ranging from 0.92 to 0.93. Test–retest reliability was 0.96. The PCL was highly correlated with other PTSD scales, including the Mississippi Scale of Combat Related PTSD (coefficient: 0.93) (Weathers et al., 1993). Keen et al. have reported very similar psychometric properties for the scale in other combat veteran populations (Keen et al., 2008). While the PCL is structured to solicit symptoms in the past month, we asked participants to answer with respect to symptoms they experienced within the last 12 months, which allowed us to better map our screening to the DSM-IV definition of PTSD.

Participants were administered the PTSD scale if they endorsed any of the traumatic experiences described above during either the first or second wave of the survey. Each participant had an opportunity to be administered the scale twice, once with respect to what they identified as the “worst” trauma related to their most recent deployment and once with respect to the “worst” trauma that occurred at any point other than during their most recent deployment. Using data on the nature of the trauma and on previous deployment dates, we determined whether the “worst” trauma not related to their most recent deployment was related to a prior deployment or whether it was experienced as a civilian. Participants were reminded of their previously identified “worst” trauma from wave 1 and were administered the scale with respect to what they identified currently as their “worst” trauma in each category. Thus, participants reported on symptoms experienced within the past 12 months, while the trauma could have happened at any time during their lifetime.

Among participants who experienced a traumatic event, participants were classified dichotomously as having PTSD or not having PTSD. To be classified as having PTSD, participants had to meet criterion B (at least one symptom of reexperiencing), criterion C (at least three symptoms of avoidance), criterion D (at least two symptoms of hyperarousal), criterion E (duration of symptoms of at least one month), and criterion F (significant impairment) (Keen et al., 2008). To meet criterion F, participants had to respond “very difficult” or “extremely difficult” to either of the following questions: “How difficult did these problems make it for you to do your work, take care of things at home, or get along with other people?” or “When you had several of these bad moods, feelings, and memories, how distressing was it for you?” Criterion A2 was dropped based on the draft DSM-V classification criteria statement and recent research in veteran populations indicating the criterion is not helpful for diagnosing PTSD (Adler et al., 2008; American Psychiatric Association DSM-5 Development; Friedman et al., 2011; Osei-Bonsu et al., 2012).

Participants could be classified in one of four ways: 1) No PTSD, 2) PTSD stemming from a deployment-related event only, 3) PTSD stemming from a civilian-related event only, or 4) PTSD stemming from both deployment- and civilian-related events. We also conducted analyses using the standard PCL cut off score of 50 for criteria B, C, and D (Weathers et al., 1993). As the results were essentially the same with both measures, we present results only for the criteria described above. Participants who experienced a traumatic event were separately given a PTSD symptom severity score for symptoms related to either a civilian trauma or a deployment trauma. PTSD symptom severity was measured using a continuous score of symptoms in criteria B, C, and D (Keen et al., 2008). The Cronbach's alpha for this sample was 0.94 for civilian-related PTSD and 0.97 for deployment-related PTSD.

2.4. Statistical methods

We constructed weights to account for the sample design, non-response, and participant sociodemographic characteristics relative to those of the overall Reserve and National Guard population. These weights have been applied to all analyses, thus results can be interpreted as applicable to the Reserve and National Guard population as of July 2009. We assessed the prevalence of problems with anger and the prevalence of anger by demographic characteristics and by PTSD status (no PTSD, only civilian-related PTSD, only deployment-related PTSD, and both civilian- and deployment-related PTSD). We used log Poisson regression models with robust standard errors to examine the association between problems with anger and PTSD and PTSD symptom severity. This approach has been shown to reliably estimate adjusted prevalence ratios (Zou,

Table 1
Characteristics of study participants by gender.

	Men				Women			
	No. (%)	Problems with anger (No. (%))	Civilian-related PTSD (No. (%))	Deployment-related PTSD (No. (%))	No. (%)	Problems with anger (No. (%))	Civilian-related PTSD (No. (%))	Deployment-related PTSD (No. (%))
Total	1036 (81.8)	519 (53.0)	29 (2.4)	39 (3.9)	257 (18.2)	117 (51.3)	13 (5.5)	4 (0.8)
Age								
18–24 years	160 (26.4)	90 (55.0)	5 (2.5)	2 (0.7)	46 (34.3)	23 (51.9)	3 (6.2)	0 (0)
25–34 years	345 (36.7)	179 (52.7)	11 (2.1)	12 (3.9)	92 (40.3)	42 (52.6)	1 (1.1)	0 (0)
35–44 years	280 (22.3)	143 (57.8)	9 (2.5)	17 (6.8)	68 (16.1)	30 (42.1)	4 (7.9)	0 (0)
>45 years	236 (14.6)	104 (45.2)	4 (3.3)	8 (5.8)	49 (9.3)	20 (54.5)	5 (18.2)	4 (9.1)
Race								
White	778 (85.2)	378 (50.0)	18 (2.6)	28 (4.0)	159 (69.6)	79 (56.4)	7 (4.4)	2 (0.6)
Non-White	152 (14.8)	75 (52.2)	5 (2.1)	6 (3.4)	73 (30.4)	29 (45.6)	4 (7.4)	0 (0)
Education								
High school or less	151 (25.5)	91 (61.2)	7 (3.7)	5 (3.7)	20 (15.6)	12 (62.2)	1 (2.7)	0 (0)
Some college	307 (39.6)	154 (51.2)	13 (2.4)	18 (5.0)	70 (40.8)	32 (48.5)	3 (4.1)	0 (0)
College or more	578 (35.0)	274 (49.1)	9 (1.6)	16 (2.9)	167 (43.7)	73 (50.0)	9 (7.7)	4 (1.9)
Rank								
Enlisted	702 (95.7)	371 (53.5)	25 (2.7)	31 (4.1)	155 (97.6)	82 (52.4)	11 (5.8)	2 (0.5)
Officer	233 (4.3)	100 (35.7)	1 (0.0)	2 (2.4)	74 (2.4)	21 (20.0)	1 (0.0)	1 (0.0)
Marital status								
Married	626 (51.0)	293 (50.1)	15 (2.2)	24 (5.3)	113 (35.7)	50 (52.9)	2 (3.5)	3 (0.0)
Not married	410 (49.0)	226 (55.2)	14 (2.7)	15 (2.5)	144 (64.3)	67 (50.3)	11 (6.5)	1 (1.3)

Raw numbers and weighted percentages are presented.

2004). We examined the associations between anger and PTSD and anger and PTSD symptom severity by type of trauma (civilian- and/or deployment-related) by restricting analyses to only those with one type of trauma (e.g. examining the association between anger and deployment-related PTSD restricted to those without civilian-related PTSD) and by using an interaction term to capture a possible interaction between civilian- and deployment-related PTSD. We examined these relations separately among men and women where we had statistical power to do so.

3. Results

The characteristics of this sample are presented in Table 1. Group differences in the prevalence of anger, civilian-related PTSD, and deployment-related PTSD were examined by demographic characteristics and gender. The prevalence of anger was similar among women and men (51.3% in women, 53.0% in men, $p = 0.6$). Civilian-related PTSD in the past year was documented among 3.0% of participants; deployment-related PTSD in the past year was documented among 3.4% of participants. Men had lower prevalence of civilian-related PTSD (2.4% for men vs. 5.5% for women, $p = 0.01$) and higher prevalence of deployment-related PTSD (3.9% for men vs. 0.8% for women, $p = 0.02$) compared to women. The prevalence of anger, civilian-related PTSD, and deployment-related PTSD did not vary significantly within demographic sub-groups, with the

exception of the prevalence of anger by education ($p = 0.006$) and rank ($p = 0.02$) in men, and the prevalence of both types of PTSD by age in women ($p = 0.01$) and deployment-related PTSD by age in men ($p = 0.003$). The mean number of deployments in this population was 2.8 (SD = 0.29); 27.6% of participants had not yet been deployed. Of those deployed, 76% had deployed to a warzone. The mean number of deployment-related traumas experienced during a participant's lifetime was 3.2 (SD = 0.11); mean number of civilian-related traumas experienced during a participant's lifetime was 4.6 (SD = 0.10). At wave 2, 9.6% of the baseline participants had left the Reserve or National Guard force.

Table 2 presents the prevalence of anger by PTSD status in men and women. There is a markedly higher prevalence of anger among those with PTSD related to either civilian or deployment-related trauma compared to those without PTSD ($p < 0.01$). Among those with PTSD related to both civilian and deployment-related traumas, all service members reported problems with anger. Notably, in the absence of PTSD, 51.5% of women and 48.9% of men report problems with anger.

In regression analyses controlling for confounders, service members with deployment-related PTSD had a higher prevalence of anger problems compared to service members without PTSD (prevalence ratio (PR) = 1.85, 95% CI: 1.62–2.12) (model excluded those with civilian-related PTSD) (see Table 3). Service members with civilian-related PTSD were also at higher risk of anger problems compared to those without PTSD (PR = 1.77, 95% CI: 1.52–2.05) (model excluded those with deployment-related PTSD). For those with PTSD stemming from both types of trauma, the prevalence ratio was 1.97 (95% CI: 1.79–2.16). As we found no evidence of effect measure modification by gender, these analyses were conducted pooling men and women to increase our precision.

We finally examined the association between PTSD symptom severity and anger problems (Table 4). In regression analyses controlling for confounders, among men without civilian-related PTSD, for each standard deviation higher level of deployment-related PTSD symptom severity, the prevalence of problems with anger was 1.21 times higher (95% CI: 1.16–1.27). A similar association was found for each standard deviation higher level of civilian-related PTSD symptom severity (among those without deployment-related PTSD) (PR = 1.27, 95% CI: 1.21–1.33). Results in women were similar: the PR for a standard deviation higher level of

Table 2
Prevalence of anger by PTSD status and gender.

PTSD status	Men		Women	
	Total (No.)	Problems with anger (No. (%))	Total (No.)	Problems with anger (No. (%))
No PTSD	976	465 (51.5%)	243	104 (48.9%)
Civilian-related PTSD only	18	15 (88.3%)	10	9 (90.9%)
Deployment-related PTSD only	27	24 (90.9%)	1	1 (100%)
Both civilian- and deployment-related PTSD	11	11 (100%)	3	3 (100%)

Raw numbers and weighted percentages are presented.

Table 3
Adjusted prevalence ratio of anger problems by PTSD type.

	Adjusted prevalence ratio (95% CI) ^a
No PTSD	—
Deployment-related PTSD	1.85 (1.62–2.12)*
Civilian-related PTSD	1.77 (1.52–2.05)*
Both types of PTSD	1.97 (1.79–2.16)*

* Significant at the 0.001 level.

^a Model weighted and adjusted for age, education, race, marital status, rank, and race.

deployment-related PTSD symptom severity was 1.55 (95% CI: 1.19–2.03); the PR for a higher level in civilian-related PTSD symptom severity was 1.35 (95% CI: 1.23–1.47).

4. Discussion

In a representative national sample of Reserve and National Guard soldiers, we found that half of all soldiers reported problems with anger within the past year. The prevalence of anger in this population is comparable to recent veteran populations (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007), suggesting problems with anger likely precede separation from the military. While no studies have examined the effectiveness of treatment for anger problems in current service members and only a few have examined these treatments in veterans, there is general support for the effectiveness of anger treatment in reducing anger problems (Taft et al., 2012). Given that anger is a problem for half of Guard and Reserve members, treatment opportunities should be made available to current service members.

This is the first study we know of to assess the prevalence of anger among men and women service members. We found that there was no statistically significant difference in the prevalence of anger by gender. This is consistent with several studies in the general population that have found little difference between men and women's frequency or experience of anger (Averill, 1983; Buntaine and Costenbader, 1997; Kopper, 1993; Kopper and Epperson, 1991, 1996; Stoner and Spencer, 1987). Yet this finding is in contrast to popular portrayals of veterans in the news media, where stories of male veterans who perpetrate violence and female veterans who are victims of violence abound (Worthen et al., 2013). These stories, however, highlight violent behavior, not anger, which may have different gendered manifestations. In the general population, women have been found to direct anger inward more than men, who tend to direct anger outward (Dittmann, 2003). Further research is needed to understand whether anger manifests similarly for men and women service members; any gender differences in the expression of anger will be important to understand in order to provide appropriate resources to help these service members address their anger.

Table 4
Adjusted prevalence of anger by PTSD symptom severity.

	Men	Women
	Adjusted prevalence ratio (95% CI) ^a	Adjusted prevalence ratio (95% CI) ^a
Deployment-related PTSD symptom severity	1.21 (1.16–1.27)*	1.55 (1.19–2.03)*
Civilian-related PTSD symptom severity	1.27 (1.21–1.33)*	1.35 (1.23–1.47)*

* Significant at the 0.001 level.

^a Model weighted and adjusted for age, education, race, marital status, rank, and race.

The prevalence of civilian-related PTSD in the past year was 3.0%, which is similar to the prevalence of PTSD in the past 12 months in the general population (Kessler et al., 2005). Deployment-related PTSD in the past year was 3.4%, which is consistent with rates of PTSD from the Millennium Cohort (Smith et al., 2008). Among both men and women, we confirmed a strong positive association between anger and PTSD.

We found that anger was also a problem for about half of men and women who do not have PTSD. To our knowledge, no previous studies have examined the prevalence of anger in a population of service members or veterans in the absence of PTSD. However, these figures are consistent with population-level estimates of anger problems with post 9/11 veterans. In a population-based survey conducted by the Pew Research Center (2011), 47% of post 9/11 veterans reported frequent outbursts of anger, and in a study of post 9/11 combat veterans using VA care, 57% of veterans reported problems controlling anger (Sayer et al., 2010). Again, it is worth noting that the high prevalence of anger does not mean a high prevalence of violent behavior. Further research should seek to understand the extent and importance of anger problems in the absence of PTSD.

While for both men and women anger was slightly more common among those with deployment-related PTSD than civilian-related PTSD, both civilian- and deployment-related PTSD were more strongly associated with anger in women than in men. However, none of these results were statistically significantly different from one another. Given the low prevalence of either type of PTSD in this population, it may be that the failure to find a statistically significant difference between these associations is a result of limited power. These results are in contrast to Castillo et al., (2002) conclusions that anger is more strongly associated with PTSD in men than in women. This difference is likely due to Castillo's sample including both women service members and wives of service members, whereas our sample included only women who were service members themselves.

Consistent with Kulkarni et al.'s (2012) research with treatment-seeking male veterans, we found that anger was significantly associated with PTSD symptom severity. Yet while Kulkarni et al. assert that anger may be a particular problem for male veterans because of the consistency of anger with a traditional male gender role, our research suggests that anger is as common a problem among women as among men, and that the association between anger and PTSD is just as robust in women as it is in men. This is consistent with qualitative research with male and female veterans that has demonstrated anger is a problem for veterans of both genders as they reintegrate into civilian society, and that women may experience greater social isolation as a result of their problems with anger than men because of gendered stereotypes of about anger (Worthen and Ahern, 2013). We recommend that clinicians assess whether anger is a problem for women service members and veterans with the same diligence that they do for men. Further research should continue to explore the mechanism of effect in the relationship between anger and PTSD in women and men and should seek to determine whether anger treatments differ in their effectiveness for men and women in order to improve treatment outcomes for both groups.

Our final aim was to investigate whether the association between anger and PTSD differed depending on whether the PTSD was associated with a civilian- or deployment-related trauma. In adjusted models, we found that the association between anger and PTSD was similar regardless of whether the triggering traumatic event was experienced as a civilian or while on a deployment. This was consistent for men and women and when we examined PTSD using DSM criteria or a continuum of PTSD symptom severity, which included individuals who experienced symptoms not

reaching the level of PTSD. The low prevalence of PTSD in this population may have made it difficult to detect any difference in the magnitude of the association between PTSD and anger based on the type of trauma should such a difference exist.

Orth and Wieland's (2006) meta-analysis examining the association between anger and PTSD in traumatized adults found a stronger association between anger and PTSD in military populations than in civilian populations. In this all-military population, anger problems were only slightly more common among those with deployment-related traumas than civilian-related traumas and the magnitude of the associations between anger and PTSD were similar for PTSD stemming from either deployment-related or civilian-related traumas. This suggests that the context of the trauma (military vs. civilian) may not be an important factor in the association between anger and PTSD in an all-military population. Further research is needed to tease out the role of the context of the trauma (military vs. civilian) in the relationship between anger and PTSD.

Some limitations to our study are worth noting. First, our baseline response rate was relatively low, although it is similar to response rates obtained in other longitudinal studies with current service members (Riddle et al., 2007). In order to address the possible selection bias that this low response rate could introduce, we calculated weights to account for non-response and applied these weights to all analyses. Second, the present analysis was cross-sectional in nature and thus we are unable to establish whether anger problems developed after PTSD or whether anger problems pre-existed exposure to trauma or the development of PTSD. This is a limitation in common with most of the research examining anger and PTSD in military populations, which tends to focus on these two factors' co-occurrence rather than focusing on establishing a causal relationship (Taft et al., 2012). As there is some question in the literature about the temporality of how anger problems impact the phenomenology of PTSD (e.g. Andrews et al., 2009; Ehlers et al., 2003; Forbes et al., 2008; Hawkins and Coughle, 2011), it would be useful to follow a military cohort to assess pre-trauma anger levels and to ascertain trajectories of anger response and PTSD symptomatology over time. Finally, we had a relatively small number of women participants compared to men. While we found similar associations between anger and PTSD among men and women, further research is needed among women to give more precision to estimates of the association.

5. Conclusion

These findings contribute valuable information about the prevalence of anger and the nature of the association between anger and PTSD in military service members. We established that anger is a common problem for current service members, in addition to veterans, and that anger is equally common among men and women in contrast to the perception that anger is a larger problem for men. We also found that the relations between anger and PTSD are similar for men and women, in contrast to previous research. Further research should explore whether the mechanisms of effect are similar for men and women. We found that the association between anger and PTSD was strong regardless of whether the triggering traumatic event was civilian- or deployment-related.

Based on these findings, we suggest that treatment for anger problems be made widely available to current service members, in addition to veterans. As anger problems are nearly as common in women as in men, clinicians should assess anger problems irrespective of gender and develop psycho-education materials specifically targeting women service members and veterans. Research examining the effectiveness of anger treatment protocols should be designed to include both male and female service members and

veterans, and investigate whether there are differences in treatment effectiveness by gender.

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Contributors

Drs. Ursano, Gifford, Fullerton, and Galea designed the study and wrote the protocol. Drs. Worthen and Ahern developed supplementary procedures for the protocol. Mr. Cohen and Ms. Sampson manage the study data and assisted in statistical analysis. Drs. Rathod, Worthen, and Ahern undertook statistical analyses. Dr. Worthen wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflicts of interest

None of the authors have any conflicts of interest to disclose.

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